FAA Data Management Program

AIO / ASY Briefing to the Administrator

August 1, 2001

Overview

- Data Management - a Worldwide as well as an FAA Challenge.
- The FAA Data Management Program.
- The FAA Metadata Repository and Data Registry.
- An ASY Success Story

The Worldwide Challenge is Growing...

"The most significant problem dealing with every organization trying to manage information is information fragmentation. We (Oracle) are selling too many databases, and you (customers in audience) are buying too many of them. If you want better information you have to be willing to spend less."

"The reason why computers have been so disappointing - why we are not getting the gains we expect - is because of fragmentation. We cannot share, one group doesn't know what the other is doing, and you cannot collaborate and cooperate and communicate."

Larry Ellison, CEO of Oracle, E-Gov Conference Keynote Speech, July 10, 2001

Where the FAA is Today

- FAA's information systems have evolved over the past 20 to 30 years to meet specific requirements.
- There is a proliferation of unique and sometimes redundant data.
- There is a need for FAA data to be more shareable, less costly to assemble, and easier to assess in terms of integrity and accuracy.

The FAA Data Management Program

Data Management Strategy

Corporate Resource
Timely, Accurate, Understandable,
Accessible, Secure

Data Management Order 1375.1C

People:

Designated Data Authorities
Data Managers
Data Stewards

Tools:

Metadata Repository (MDR)
FAA Data Registry (FDR)

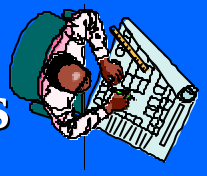
Processes:

Registration
Standardization
Certification
Life-Cycle Management
Quality Assurance

Benefits

Return on IT Investment

Document Intellectual Capital



Development

Analysis

What the Program Does

- New Development:
  - Allows us to deploy new systems with data that is shareable and commonly understood.
  - Reduces some development through data reuse.
- Legacy Data:
  - Allows us to know what we have, what it means, where it resides, and how it is represented.
  - Provides infrastructure to begin to clean existing data, reduce redundancy, retire obsolete data.

Drivers for Change

- Increasing volume and complexity of global aviation system.
- Increasing demands to share information nationally and internationally.
- Increasing demand to increase return on investment for IT.
- Increased need for Agency data to be less dispersed, more consistent, and better understood.

An Illustration of the Challenge

Inconsistent Data: For Any Individual Flight…

There are

Various aircraft positions:

Actual?
Assigned?
Calculated?
Current?
Estimated?
Filed?
Last?
Next?
Predicted?
Preferred?
Projected?
Requested?
Scheduled?

That Use

Various data combinations to express those positions:

Data: Time
Clock Time?
Elapsed Time?
UTC(Greenwich)?
Local?

Data: Unit of Altitude
Flight Level (100's feet)?
Feet?
Meters?

Data: Altitude
Above Ground Level?
Mean Sea Level?
Pressure Altitude?

Data: Unit of speed
Knots?
Mach?

Data: Aircraft speed
Ground Speed?
True Airspeed?
Indicated Airspeed?

Data: Coordinate System
Spherical?
Stereographic?

Data: Coordinate Position
Latitude/Longitude?
Cartesian Coordinates?
Polar Coordinates?

(Slide Courtesy of ASD-120 and MITRE/CAASD)

An Illustration of the Challenge

Example: At 2:08:45 Zulu, aircraft is located 50 nm east and 25 nm south of surveillance radar at 24000 feet

System	Location Definition	Data Type	Precision/Units	Example
URET (Cartesian)	X:: = Double-precision float Y ::= Double-precision float Altitude ::= Double-precision float Time: Double-precision float	Float Float Float Float	Feet Feet Feet Seconds	303800.00 151900.00 24000.00 07725.00
ASTERIX (lat-long)	Latitude ::= 24 bit Longitude ::= 24 bit Altitude ::=14 bit Time ::= 24 bit	Binary Binary Binary Binary	LSB = $180°/2^{23}$ LSB = $180°/2^{23}$ LSB = 25 ft LSB = $1/2^{7}$ s	000111100011001011010010 110000101000100101001011 00001111000000 000011110001011010000000
ASTERIX (Cartesian)	X ::= 16 bit Y ::= 16 bit Altitude ::= 14 bit Time ::= 24 bit	Binary Binary Binary Binary	LSB = 1/128 nm LSB = 1/128/nm LSB = 25 ft LSB = LSB = $1/2^{7}$ s	0001100100000000 1111001110000000 00001111000000 000011110001011010000000
Host to STARS (Cartesian)	X ::= 12 bit plus 1 bit sign Y ::=12 bit plus 1 bit sign Altitude ::= ddd Time ::= (not included)	Binary Binary Character	LSB = 1/8 nm LSB = 1/8 nm LSB = 100 ft	0000110010000 1000011001000 240
ASR-9 to STARS (polar)	Range ::= 12 bit Azimuth :: = 12 bit Altitude ::= 12 bit Time ::= (not included)	Binary Binary Binary	LSB = 1/64 nm LSB = $180°/2^{11}$ LSB = 100 ft	110011100010 010100101110 000011110000

Legend: LSB = Least Significant Bit (Digit)

(Slide Courtesy of ASD-120 and MITRE/CAASD)

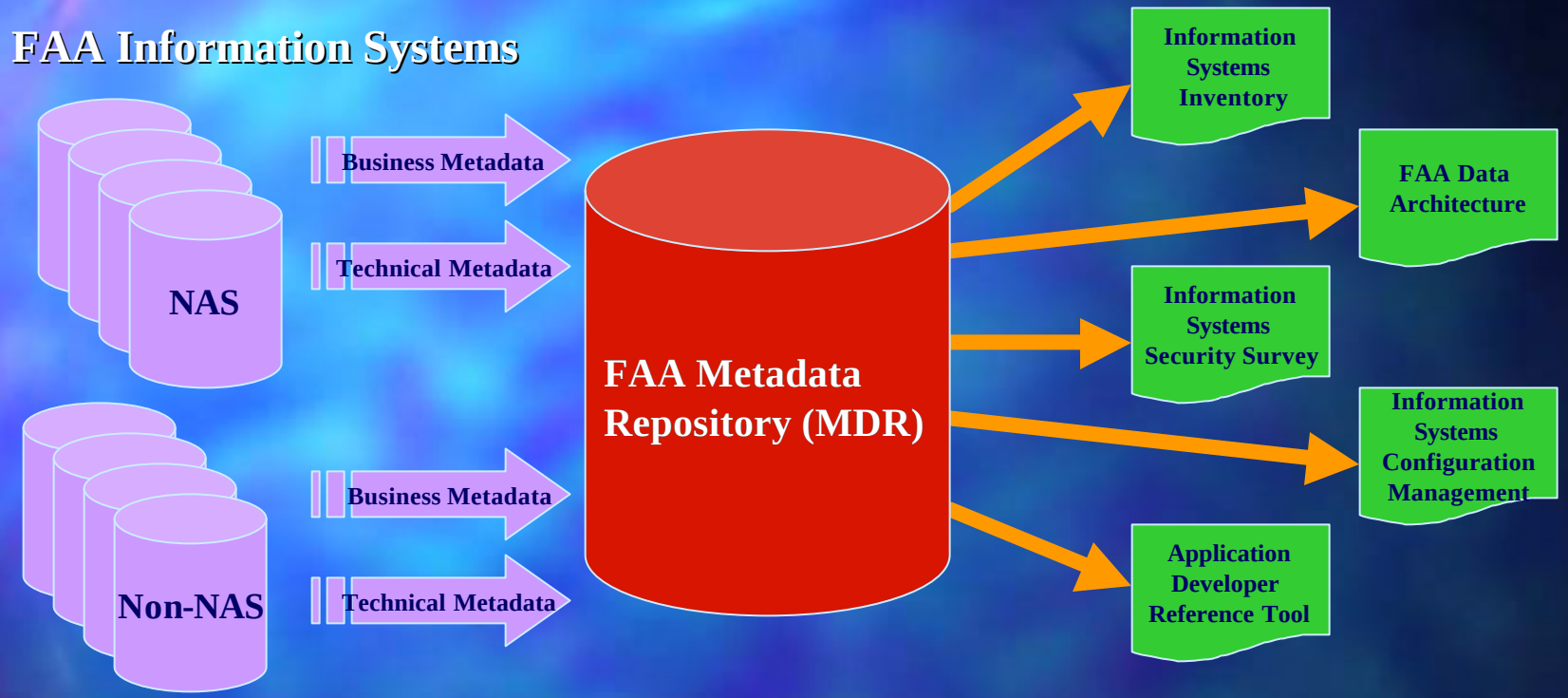
How Data Management Can Help FAA

- Adaptation process will be greatly improved (e.g. STARS needs better data quality)
- Facilitate the exchange of data with all stakeholders to include international.
- Free Flight requires high degree of data sharing.
- Administrative systems require data standards for integration.
- A range of new analysis tools can now be adopted.

The FAA Metadata Repository (MDR)

- Metadata means data about data.
- Serves as the “card catalog” for data in our information systems “library”.
- Stores data on what we have, where it resides, who owns it, what it means and how it’s represented.
- Primary reference tool for developers and analysts.
- Provides infrastructure to clean legacy data.
- Documents intellectual capital.
- Jointly developed by ATS and AIO using the National Data Center.

FAA Metadata Repository



Business User | Business Metadata | System Information of Interest | Technical Metadata | Technical User

The FAA Metadata Repository (MDR)

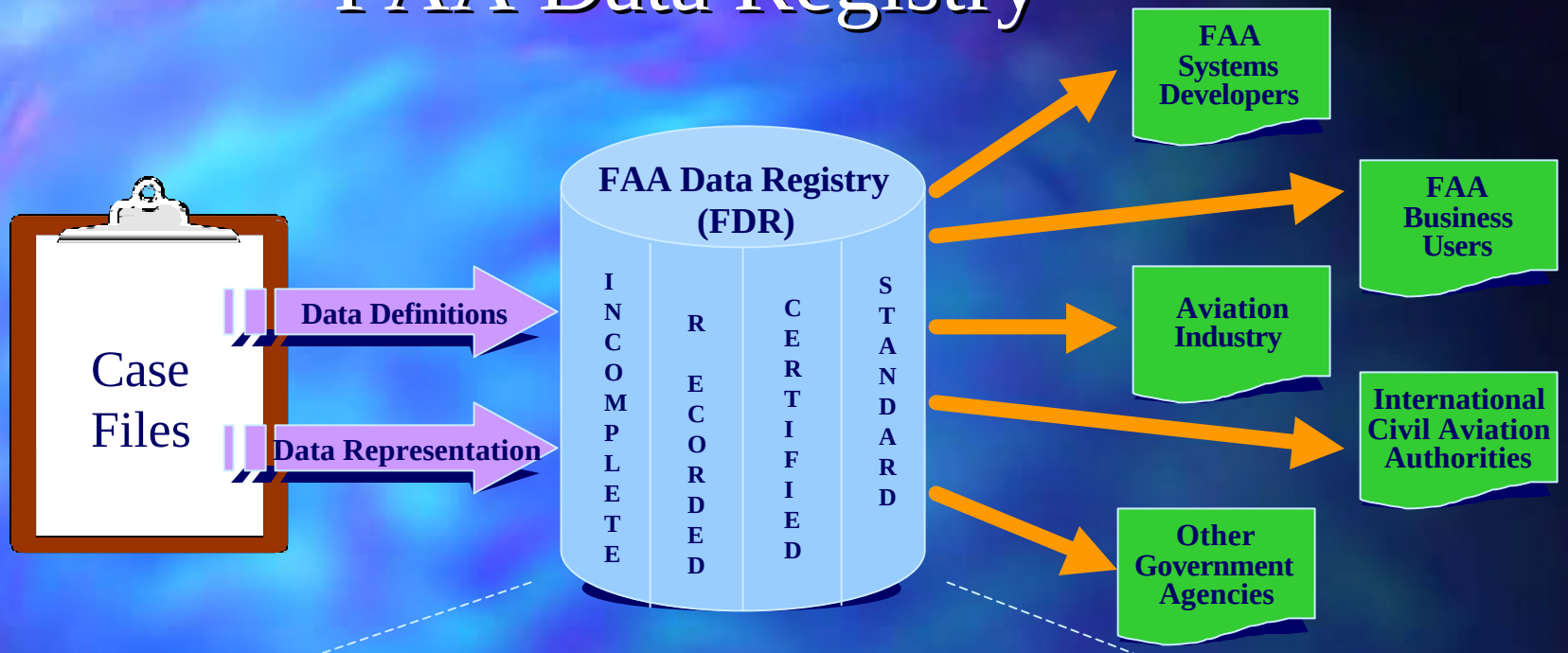
- Contains inventory of 903 information systems.
- Allows for quick searches for data requests by system, subject data, owning organization, project manager.
- Basis for developing the data architecture.
- Supports the information systems security program by housing the Initial Survey and tracking Security Certification and Authorization Packages (SCAPs).

The FAA Data Registry (FDR)

- Houses application independent data standards (e.g. latitude, longitude, elevation, time).
- ISO/IEC 11179* compliant is important to sharing data externally:
  - Internationally recognized.
  - Single source of application independent data element standards
  - Comprehensive, extensive documenting of information (metadata) for data elements.
  - Avoids duplicate data standards.
  - Provides guidance for formulating good data element definitions and names.

    * *Specification and Standardization of Data Elements*
- Documents intellectual capital.
- Jointly developed by ASD, ASY, and AIO using Census Bureau Data Registry.

FAA Data Registry



Quality Status Levels

INCOMPLETE	RECORDED	CERTIFIED	STANDARDIZED
Candidate Data Standard	NIAC Core Committee/ Working Groups	NIAC Co-Chairs (ATS/ARA/AIO)	NAS Configuration Control Board (ATS/ARA)	Official Data Standard
Stewards Business Users	Terms of Reference Prepare Case File Recommend Approval	NIAC Charter Manage Process Must-Evaluation Approve Case File	NAS CCB Charter Approve Standard Publish Standard FAA-STD-060	Developers External Stakeholders

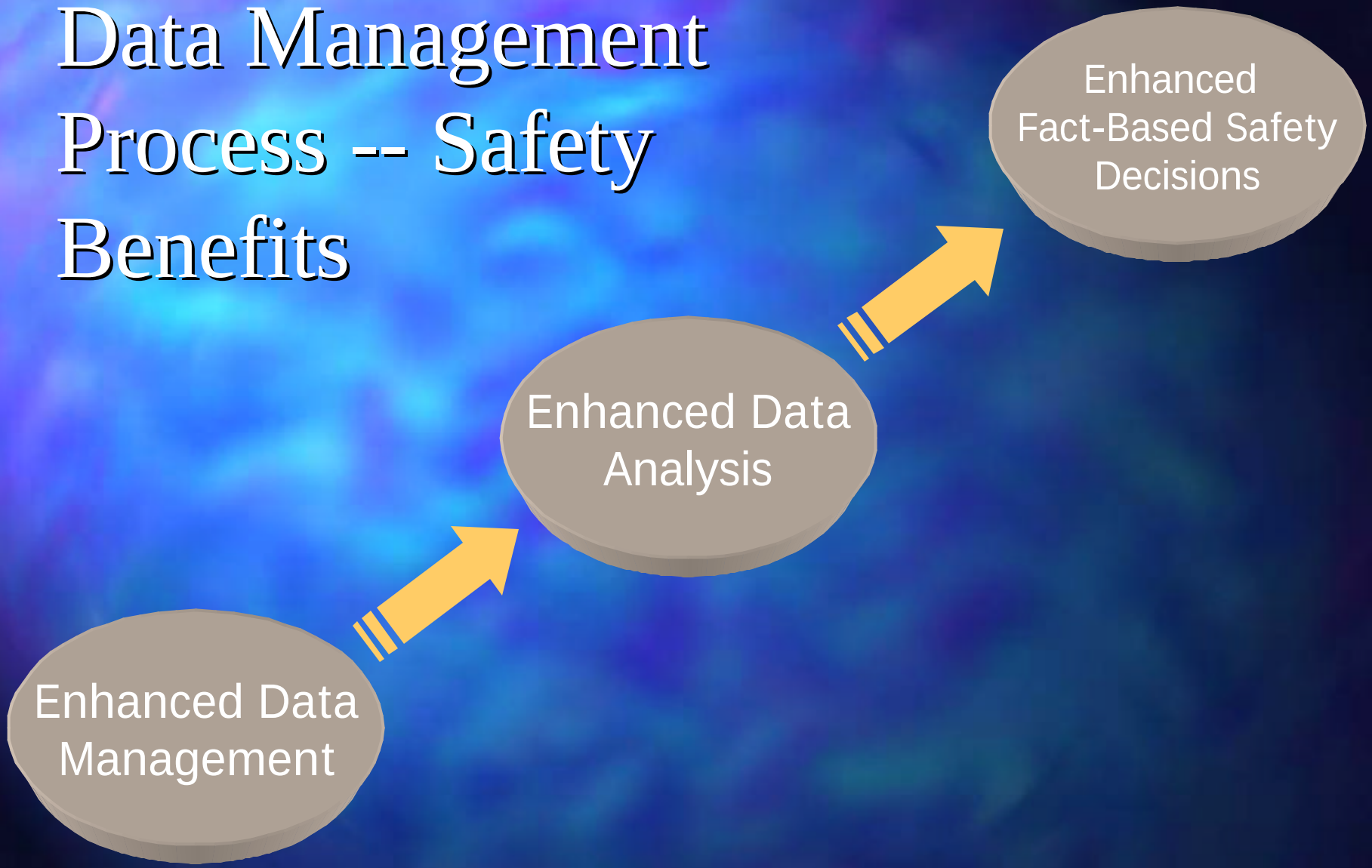
The FAA Data Registry (FDR)

- Currently contains 1st case file of 32 adaptation data elements to include latitude, longitude, elevation, and time.
- Preparing 4 more case files including one for make, model, and series of aircraft.
- Concentrating on data standards that will support NAS modernization.

Some Industry and Government Examples...

- By giving its customers immediate online access to their data to check status, FedEx has saved an estimated $700 million a year.
- By providing an inexpensive common architecture linking seven formerly separate systems, the EPA has experienced an 85% decrease in FOIA request. EPA estimates it will save $30 to $40 million a year by 2001.
- In an InformationWeek research survey of 300 IT executives last year, 81 percent ranked data quality as the most important IT priority.
- ASY will now discuss how data management has improved analysis of safety data.

Data Management Process -- Safety Benefits



The Challenge

Before:

missing data

NTSB.XLS

1	FAA CODE	OPERATOR	OPERATOR DBA	OWNER
30	ARW	AIR WISCONSIN	UNITED EXPRESS	AIR WISCONSIN
31	DAL	DELTA AIR LINES		AIR LINES
32	DALA	DELTA AIR LINES		AIR LINES
33		DELTA AIR LINES	ATLANTA AIR LINES	
34				FEDERAL EXPRES
35	DA	DELTA AIRLINES		LTA AIRLINES

inconsistent data

invalid data

After:

NASDAC.XLS

1	STANDARD	OPERATOR	OPERATOR DBA	OWNER
30	AWAA	AIR WISCONSIN	UNITED EXPRESS	AIR WISCONSIN
31	DALA	DELTA AIR LINES		DELTA AIR LINES
32	DALA	DELTA AIR LINES		DELTA AIR LINES
33	DALA	DELTA AIR LINES	ATLANTA AIR LINES	
34	FDEA			FEDERAL EXPRES
35	DALA	DELTA AIRLINES		DELTA AIRLINES

Early Focus on Safety Data Management

- NASDAC Pioneered Agency-wide Safety Data Management (1996)
- White House, NCARC Recommendations Put Spotlight on Enhancing Safety Data Integration and Standardization (1997)
- Safety Data Standardization Focused Initially on Make/Model

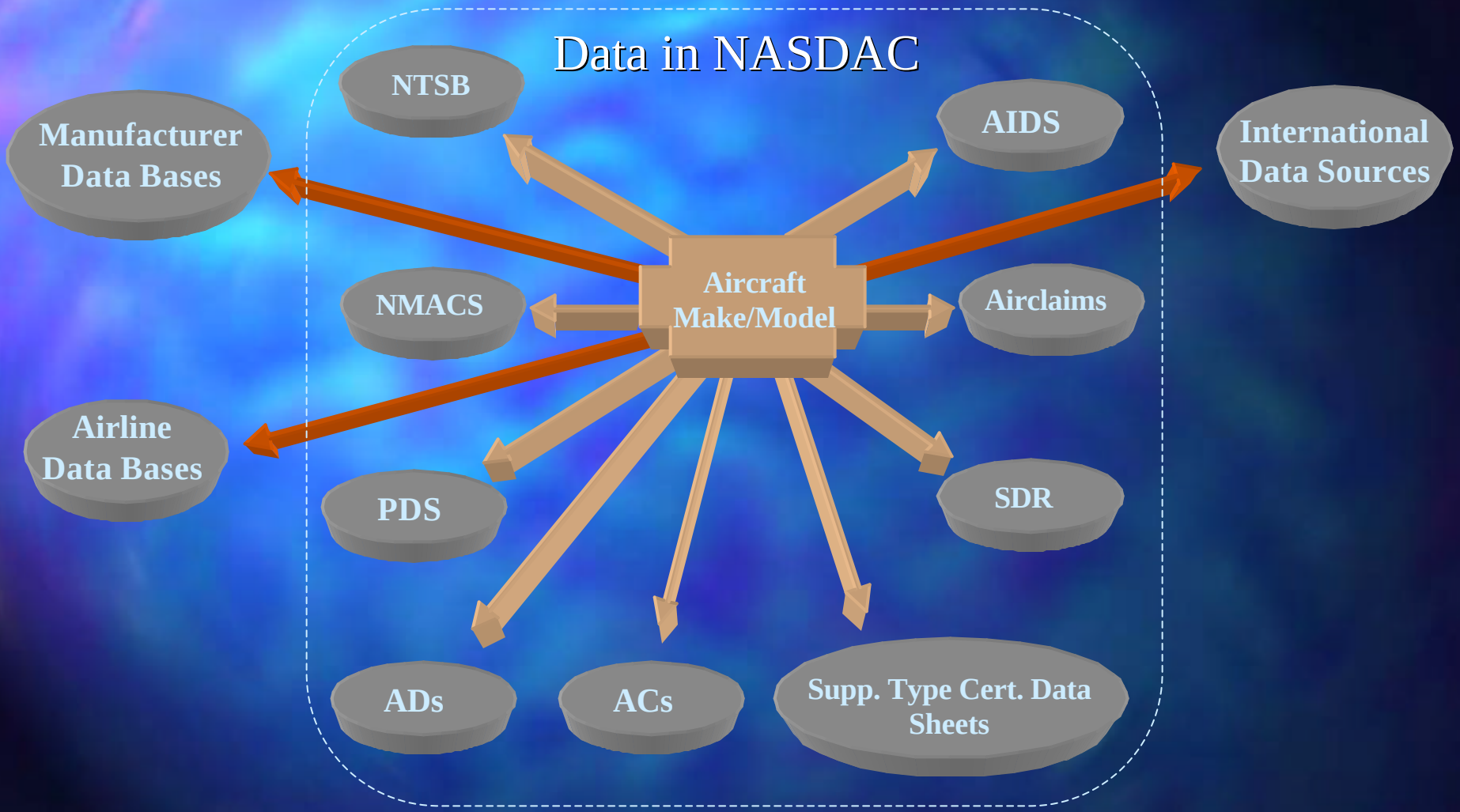
NASDAC Data Management

- **Original Goal: Analytical Search Across Multiple Data Systems**
  - Labor intensive “work around” of data standardization, quality issues
  - Lack of standardization prevented development of more customized/specialized analytical capabilities
- **Advanced Data Architecture**
  - Internal NASDAC data management program; establish and apply internal standards, collect business rules on safety data
  - Micro version of FAA Data Registry, Metadata Repository
  - Significant cost savings: redirected resources to system safety analysis and tools applications

Make/Model Data Standard

- Identified 5 data elements that, once standardized, would allow safety data to be integrated across virtually all safety data bases
  - Make/Model
  - Operator
  - Date
  - Location
  - Time
- Identified Make/Model as most critical data element
- Initiated international effort, under ongoing ICAO/CAST Common Taxonomy Team, to establish standard

Make/Model Data Standard



The Safety Benefit

- The FAA Data Management Policy will give us an enhanced ability to acquire, share, and integrate, data and information from various aviation community sources, including international sources

- Our ability to focus on improving analytical processes will thus grow, as will the quality of information transmitted to agency safety decision makers

Summary

- A practical approach that focuses on:
  - New development.
  - Registration of legacy metadata, but no redesign of legacy systems.
  - Leveraging existing infrastructure and processes:
    - National Data Center Metadata Repository
    - Census Bureau Data Registry
    - Acquisition Management System
    - Configuration Management (NAS Configuration Control Board, NAS Information Architecture Committee)
- Represents the best practices of industry and government.
- Provides the infrastructure to make FAA data more timely, accurate, understandable, accessible, and secure.